The Gardens' Bulletin STRAITS SETTLEMENTS,

Vol. II Issued August 12th 1918 No. 2.

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To be purchased at the Botanic Gardens, Singapore; from Messrs. Kelly and Walsh, Ltd., No. 32 Raffles Place Singapore.

Printed at the Methodist Publishing House, Singapore.

DEPARTMENTAL NOTICES.

Requests for yams should be received not later than early September.

Plants of the Avocado or Alligator Pear—*Persea gratissima*,—and Brazil nut—*Bertholletia excelsa*,—to be sold within the Peninsula at fifty cents each.

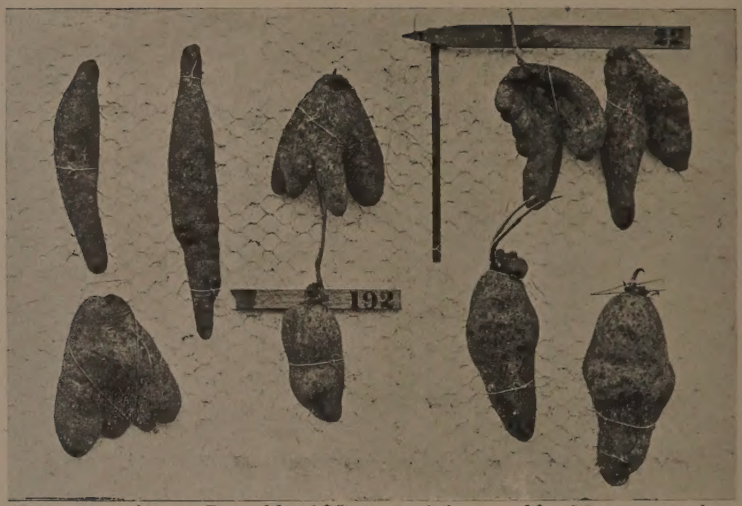
Seeds of *Hevea brasiliensis*—Para Rubber—as available from trees, twenty-eight years old, to be sold at three dollars per thousand up to the number of ten thousand, and at two dollars and fifty cents for every further thousand on the same order.

The Gardens' Bulletin is published as material becomes available. Its price is fifty cents a copy, post free, or in advance for a volume of twelve numbers, post free,

Five dollars in the Straits and Federated Malay States.

Nine and a half rupees in India and Ceylon.

Thirteen shillings in Europe.



Dioscorea alata. Race No. 192 on the left, race No. 22 on the right.

Dioscorea alata. Race No 70.

THE

GARDENS' BULLETIN,

STRAITS SETTLEMENTS.

Vol. II. Issued August 12th 1918 No. 2

A REPORT UPON THE EXPERIMENTAL CULTIVATION OF THE GREATER YAM—DIOSCOREA ALATA—IN 1917.

This is the third of a series of reports upon the cultivation of the Greater Yam in the Gardens, Singapore. The first was printed in this *Bulletin*, vol. I., No. 9, pp. 297-304, and in it outline camera lucida drawings of sixteen races were given. The second report was printed in Vol. I., double No. 11-12, pp. 371-396, with illustrations from photographs of fifteen races upon six plates. In this report fourteen races are illustrated upon four plates, No. 76 appearing upon two of them. Besides these three reports, there is another in the *Philippine Agriculturist and Forester*, Vol. III., 1915, pp. 205-209, with illustrations of seven races. When the first report in the *Gardens' Bulletin* and that in the *Philippine Agriculturist and Forester* were published, the numbering system of the Gardens had not been made consistent, and was not referred to: therefore it is now convenient to draw into one list the races already illustrated,—being in all thirty-eight. This list is printed as an appendix on pp. 42-44.

The plates with this report show successively various morphological features not brought out before. All the figures are on the same scale, which is indicated by a half-metre measure in each block. The upper block of the first plate shows what variation may be found in sister plants; it represents five tubers of an African race called on the Gold Coast Eururuka nkakyi, and in Singapore grown under the number 192, together with four tubers of a race from Manila grown under the number 22. The African race produced tubers varying greatly in relative length, and in branching and in being sometimes flattened and sometimes round in transverse section: the Manila race varied in its tubers being sometimes flattened and sometimes round. It is necessary to ascertain the "why" of this, if the classification is to be perfected; and attention is directed to it accordingly. The lower block of plate i, exhibits four tubers of a race from Manila grown under number 76,

of which two more tubers are shown on plate ii, at the top on the right. These tubers were usually deeply fingered, which is not such as the race had produced in 1916 (vide Plate ii, of the Bulletin, Vol. I, double No. 11-12). It may be that twinning and grouping of tubers is the result of an arrest of the first attempt at tuber-formation in such a case; but this is a guess only to be investigated by experimentally varying the conditions in planting. The upper block of plate ii. illustrates approximately the condition which Sir David Prain and the writer named "farciniformis" or sausage shaped,—a condition common in the Gangetic valley and in other parts of India, which has not been figured in the previously printed plates. It is seen that when the race No. 76, is at one of its extremes, namely that on the right of the Plate ii, it is such as can reasonably be classed as farciniformis but at another extreme it is far away. This observation is a caution against accepting ill-developed tubers as proving their race to belong to "farciniformis."

Race 76 has other characters than those of shape which must be remarked: its flesh is peculiarly firm and of the yellow of old ivory. Cooked it was pronounced fair. It is a heavy yielder, with a prickly stem.

Continuing the comments on the plates, and turning to the middle block of plate ii, four tubers of race 132,—the Fijian "Uvi kaboa"—are seen, above four tubers of the race No. 44, which was received from the Bureau of Agriculture, Philippine islands. These illustrations will serve as references, so that it may be possible in descriptions to point to them saying, "fingered to the degree of No. 132," or "fingered to the degree of No. 44."

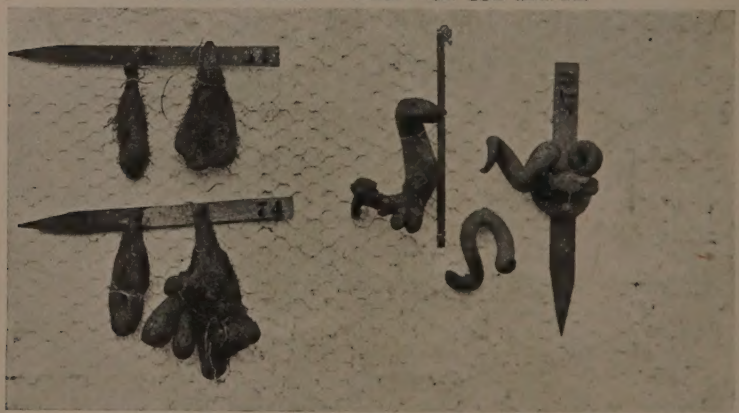
The bottom block of plate ii, has a historical bearing, for it exhibits what Rumphius called *Ubi tangan* or Hand yam, and *Ubi ular* or Snake yam, the first on the left in races 14 and 74, and the second on the right in race 370. All three came from the Philippine islands. To be really like a hand, the tubers must be well grown; fasciation wherefrom the flatness comes not developing unless the tuber is strong enough to branch freely. Therefore the tubers on the extreme left which are not well developed, do not show it. Rumphius hitherto has been much misunderstood in regard to Ubi ular: Roxburgh though it must be a wild yam other than *Dioscorea alata*, and called a most unlike Indian species "Dioscorea anguina" in consequence (Flora indica, 1832, iii, p. 803).

It is quite certain that Ubi ular is *Dioscorea alata*, and as that tuber shows which in the plate is in contact with the half-metre measure, it should be classed along with those races which do not bury their tubers by descending into the earth, but may extrude them,—those which have to be cultivated by earthing-up.

Plates iii, and iv, are both given to illustrate this peculiar group,—the not-burying or apogeotropic group. Plate iv, illustrates it at its extreme; plate iii, shows races which are intermediate between the more usual state and it. Firstly on the upper

Dioscorea alata. Races Nos. 140 and 76.

Dioscorea alata. Races Nos. 132 and 44.



Dioscorea alata. The flattened tubers of Nos. 14 and 74, and the snake-like tubers of No. 370.

Dioscorea alata. Race No. 174 showing how its fingers tend to be horizontal, and race No. 78 showing fingers which descend.

Dioscorea alata - Race No 28, a curving flattened and somewhat fingered yam.

block of plate iii, are shown tubers of race 174, Khoai tiem from Saigon, in which the fingers diverge, and race 78, a yam from Manila, in which they do not. They are shown together for contrast, as it is easy to conceive transitions whereby the interval between race 174, and races 38 and 72, might be bridged through race 28. In race 28, which was received from the College of Agriculture, Los Banos, Philippine islands, as Tumuktok, the tuber exhibits a tendency to divide into two which curve away from each other, and in the angle between them a series of smaller branches may appear. On plate iv, lower block, one of the tubers photographed shows down its side just such a series of smaller branches as form in race 28.

Race 28 behaved slightly differently in 1916 (vide plate v of the Bulletin Vol. I, double No. 11-12); and that this was so, is interesting, for it suggests how considerable an influence the conditions may have upon the form,—influences at present only to be recognised as operative but to be analysed by further work. It is well known that monstrosities of all kinds in plants appear fixable by selection, but the tendency to exhibit them is suppressed if the plant is weakly or not under the best of conditions. So would it be with regard to these yams; and therefore if their characters are to be brought out, they must be richly cultivated.

This brings us to the conditions of the 1917 crop. An attempt was made in 1917 to get more into the available ground by closer planting than in 1916. Most of the sets were planted 2 feet by 3 feet (only the up growing yams 2 feet by 9 feet) whereas in 1916 they had been 2 feet by 5 feet. This closer planting while agriculturally correct because the yield was hereby increased, was not sound from the botanical standpoint, as the plants competed with each other too much to develop quite freely and fully, the returns from each race at the same time varying inconsistently from those got in 1916. The following are tables comparing the two years.

YAMS, NOT REQUIRING EARTHING UP.

	Year 1916.	Year 1917.
No. of hills	582	520
Area	11330 sq. feet	3120 sq. feet
being of an acre	.260	.072
or of a hectaire.. ..	.105	.025
Sets which failed	23	84
which grew	559	424
Return	1810076 grammes 3989 lbs.	961117 grammes 2118 lbs.
Yield per hectaire ..	17238.82 kilos	38444.68 kilos
per acre	6.89 tons	13.16 tons
Average yield per hill ..	3110 grammes	1849 grammes
i.e. failures included ..	6.85 lbs.	4.07 lbs.
Average yield per plant ..	3238 grammes	2267 grammes
which grew	7.14 lbs.	4.99 lbs.

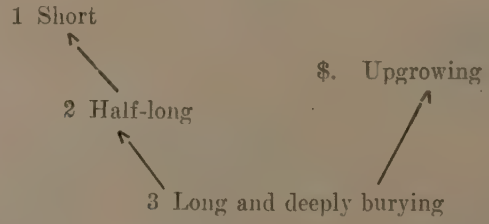
YAMS REQUIRING EARTHING UP.

	Year 1916.	Year 1917.
No. of hills	61	51
Area	1188 sq. feet	918 sq. feet
being of a hectaire ..	.011	.0085
being of an acre	.027	.021
Sets which failed	0	3
Sets which grew	61	48
Return	189259 grammes 417 lbs.	153207 grammes 338 lbs.
Yield per hectaire ..	17205.36 kilos	18021.18 kilos
Yield per acre	6.89 tons	7.18 tons
Average per hill	3103 grammes	3004 grammes
i.e. failures included ..	6.84lbs.	6.63 lbs.
Average per plant	3103 grammes	3192 grammes
which grew	6.84 lbs.	7.04 lbs.

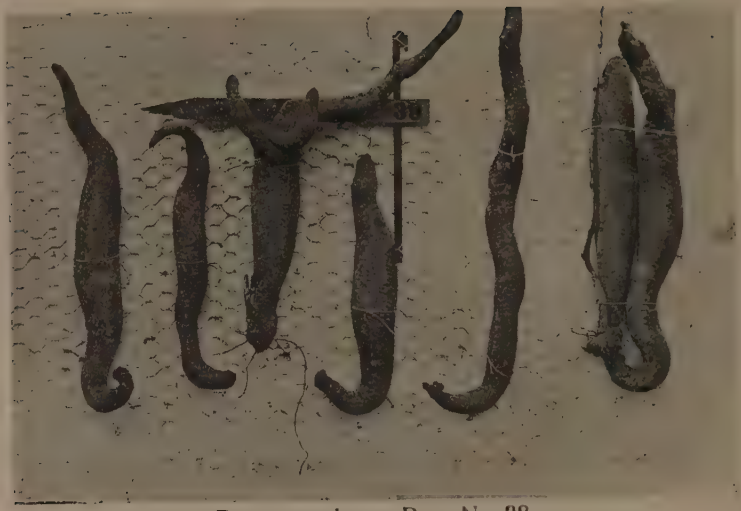
It is distinctly of interest that these upgrowing yams which in 1917 had wide intervals of nine feet between the rows in which they stood (for the convenience of earthing them up) should have returned scarcely more with these nine feet intervals than they did in the year 1916 when the intervals were five feet; for it indicates that the interval of five feet is quite adequate to prevent competition between the rows under the conditions of soil and climate that they were subjected to.

The return of the other yams was, as stated already, reduced when in the year 1917 the rows were approximated.

The year 1917 was a very wet one, and the water table so rose in the soil as to make the conditions very wet at the lower end of the piece of land used. At this lower end were the deeper going yams. The yams were in fact planted in accordance with the scheme which was proposed as a basis for classification in this Bulletin, vol. I, p. 377 in the following diagram.



those to the left occupied one bed with the longer at the lower end, and the upgrowing occupied another bed. The first bed had a gentle slope, so that the deeper going were the more likely to be water-logged.



Dioscorea alata. Race No. 38.

Dioscorea alata. Race No. 72.

The following table suggests, but does not prove that they were placed at a disadvantage.

	In 1916.	In 1917.
Races with the longest tubers	236 tubers with average weight 3336.99 gr.	125 with average weight 1795.64
Races with shorter tubers	114 do. 4575.17	78 do. 2750.54
Short tubers	106 do. 3543.75	94 do. 2401.95

being a reduction upon the longest of .. .. 46 per cent.
the shorter .. .. 40 „
the short .. .. 32 „

The figures also suggest that it is not the longest and deepest going which give the largest returns; but that those which are half-long, or perhaps one might say between half-long and long, are the most prolific.

The return per area, but not the relative return was interfered with by thieves who robbed at night but not discriminatingly, taking from the back of the bed where they thought their operations most hidden.

In this Bulletin, Vol. I, p. 306 the advantage to the new plant of using the top of the old tuber for a set was stated, and on p. 307, it was shown by how much these tops give an early start to the new shoot. In 1917 top halves were planted against bottom halves in no less than 56 races, 154 tops against 136 bottoms. In 42 races the average weight of the tubers produced by the tops was greater than the average weight of tuber produced from the bottoms, and in 13 cases it was the reverse.

Most of the races grown have now been tried cooked at least once; but so long as the Gardens are without the use of a laboratory, accurate comparisons are most difficult to make. The opinion has been formed that all the upgrowing yams are excellent for the table when properly cooked. The others vary a little among themselves. Further examinations will be made, especially with a view to desisting from cultivating that which is inferior.

Hitherto the study of the morphology of the tubers has demanded the cultivation of them all.

The classification resulting may be expressed by the following table wherein the numbers given denote the races which have been figured.

Elongation and branching of the tuber.		Combined with flattening of the tubers.	Combined with multiplication of tubers arising from stem-tissue.	Combined with tendency of a stem tissue to produce additional uprising fleshy autumn shoots.
Class 1. Short.				
a. unbranched	26, 70		26	
b. lobulate	24	50, 58, 88. 192		
c. fingered	78, 170, 74	20, 44, 98	22	
Class 2. Half long.				
a. unbranched	8, 132, 192		8,	2, 6, 8, 18, 140
b. with lobe-like branches	10	14, 74		
c. with finger-like branches	76			
Class 3. Long.				
31 tubers set into stem tissue				
a. unbranched	12, 68, 118, 156		12, 30	16
b. with lobe-like branches				
c. with finger-like branches				
32 tubers attached by a neck to stem-tissue.				
a. unbranched	162			
b. with lobe-like branches...	186			
c. with finger-like branches				
4 **Not burying.**				
a. unbranched	32. 72			
b. with lobe-like branches ...			34, 38	
c. with finger-like branches		28, 36, 370		

A list of the races already figured: the number after the name is that under which they were received.

No. 2, native name unknown, origin a deserted garden on Bukit Timah, Singapore island, Gard. Bull. I, Nos. 11-12, pl. iii.

No. 6. "Ubi merah," origin Singapore market. Gard. Bull. 1, Nos. 11-12, pl. iii.

No. 8. "Ubi, red fingered," origin Luzon, Gard. Bull. 1, No. 9, fig. 1 on p. 299.

No. 10. "Tugui, finger shaped, No. 1057," origin Luzon, Gard. Bull. 1, No. 9, fig. 2 on p. 299.

No. 12. "Ubi, finger shaped, No. 1056," origin Luzon, Gard. Bull. 1, No. 9, fig. 4 on p. 299.

No. 14. "Paquit, No. 3790," origin Luzon, Gard. Bull. 1, No. 9, fig. 8 on p. 299; and II, No. 2, plate ii.

No. 16. Origin Luzon, Gard. Bull. 1, No. 9, fig. 6 on p. 299; and Philip. Agric., 111, fig. 14 on p. 207.

No. 18. "Ubi, red No. 1042," origin Luzon, Gard. Bull. 1, No. 9, fig. 5 on p. 299.

No. 20. "Ubi, red, No. 1031," origin Luzon, Gard. Bull. 1, No. 9, fig. 10 on p. 299; and Philip. Agric. III, fig. 16 on p. 207.

No. 22. "Ubi, white, No. 1019," origin Luzon, Gard. Bull. 1, No. 9, fig. 8 on p. 299; and II, No. 2, plate i.

No. 24. "No. 931," origin Luzon, Gard. Bull. 1, No. 9, fig. 7 on p. 299.

No. 26. "Ubi, white, No. 1055," origin Luzon, Gard. Bull., vol. I, No. 9, fig. 9 on p. 299.

No. 28. "Tumuktok, No. 1095" from the College of Agriculture P. I. Gard. Bull., vol I, No. 9, fig. 1 on p. 301 and Nos. 11-12, plate v; and vol. II, plate iii.

No. 30. "Ubag, No. 960" from the College of Agriculture, P. I. Gard. Bull., vol. I, No. 9, fig. 2 on p. 301.

No. 32. "Tinuque, No. 956," from College of Agriculture, P. I. Gard. Bull., vol. I, No. 9, fig. 3 on p. 301; and Philip Agricult., vol. III, fig. 18 on p. 207.

No. 34. "Ballolong, No. 943," from the College of Agriculture, P. I., Gard. Bull., vol. I, No. 9, fig. 4 on p. 301.

No. 36. "No. 935," origin Manila., Gard. Bull., vol. I, No. 9, fig. 5 on p. 301.

No. 38. "Tamis, Ubi, white, No. 945," from Bureau of Agric. Manila, Gard. Bull., vol. I, No. 9, fig. 6 on p. 301: and Nos. 11-12, plates v and vi, and vol. II, plate iv.

No. 44. "Ubi, red, No. 1025," from the Bureau of Agriculture, Manila, Gard. Bull., vol. II, No. 2, plate ii.

No. 50. "No. 824," from the Bureau of Agriculture, Manila, Philip. Agricult., vol. III, fig. 17 on p. 207.

No. 58. "Binaksan, Ubi, No. 329," from the College of Agriculture, Philippine Islands, Philip. Agricult., vol. III, fig. 15 on p. 207.

No. 68. "No. 1692," from Bureau of Agriculture, Manila., Philip. Agricult., vol. III, fig. 12 on p. 207: Gard. Bull., vol. I, Nos. 11-12, plate ii.

No. 70. "Caroline Islands yam, No. 3793," from the Bureau of Agriculture, P. I. Gard. Bull., vol. I, Nos. 11-12, plate ii.

No. 72. "Sinawang pulo yam, No. 955," from College of Agriculture P. I. Gard. Bull., vol. I, Nos. 11-12, plate vi. and vol. II, No. 2, plate iv.

No. 74. "Ubi from Aringay in La Union Province, No. 937," from the Bureau of Agriculture, Manila, Gard. Bull., vol. II, No. 2, plate ii.

No. 76. "Sinanto, No. 958," from the College of Agriculture, P. I. Gard. Bull., vol. I, Nos. 11-,12 plate ii; and vol. II, No. 2, plates i and ii.

No. 78. "Ubi, No. 938," from the College of Agriculture, P. I., Gard. Bull., vol. II, No. 2, plate iii.

No. 88. "Ubi, red, No. 1041," from the Bureau of Agriculture, P. I., Gard. Bull., vol. I, Nos. 11-12, plate iv.

No. 98. "Khoai Siam," from the Botanic Garden, Saigon, Gard. Bull., vol. I, Nos. 11-12, plate iv.

No. 118. "Fijian yam, No. 20710," from Royal Botanic Gardens, Calcutta, Gard. Bull., vol. I, Nos. 11-12, plate i.

No. 132. "Fijian yam, Uvi kaboa, No. 20679," from Royal Botanic Gardens, Calcutta, Gard. Bull., vol. II, No. 2, plate ii.

No. 140. "No. 35560," from the Royal Botanic Gardens, Calcutta, Gard. Bull., vol. II, No. 2, plate ii.

No. 156. "Fijian yam, No. 20702," from Royal Botanic Gardens, Calcutta, Gard. Bull., vol. I, Nos. 11-12, plate i.

No. 162. "Phan shriew, from the Khasia hills, No. 35606," from the Royal Botanic Gardens, Calcutta, Gard. Bull., vol. I, Nos. 11-12, plate i.

No. 170. From Port Darwin, Australia, Gard. Bull., vol. I, Nos. 11-12, plate iv.

No. 174. "Khoai tiem," from the Botanic Gardens, Saigon, Gard. Bull., vol. II, No. 2, plate iii.

No. 186. "No. 35575, from Lumding, Assam," from the Royal Botanic Gardens, Calcutta, Gard. Bull., vol. I, Nos. 11-12, plate i.

No. 192. "Eururuka nkakyi, No. 17," from the Gold Coast, Department of Agriculture, Gard. Bull., vol. II, No. 2, plate i.

No. 370. Origin uncertain, but almost certainly Luzon, Gard. Bull., vol. II, No. 2, plate ii.

ORCHID NOTES.

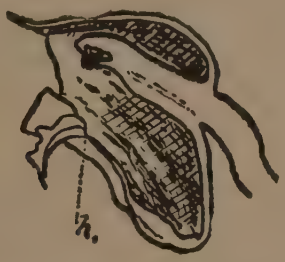
Acanthephippium javanicum, Blume.

The discovery of this orchid on Gunong Tampin, Negri Sembilan, not only adds a large-flowered species to the list of those known to occur in the Malay Peninsula but adds a genus; for no species of *Acanthephippium* have been found within our borders previously. It occurs on the mountain at about 1800 feet above sea-level in forest about the sides of a stream in a little sandy hollow of unusual conformation. From this spot it has been introduced into the Botanic Gardens, Singapore; where it grows freely.

Flower of *Acanthephippium javanicum*, slightly reduced, viewed horizontally from the side, and from in front.

The plant was first described by Blume who had found it on Gunong Salak in Java. He afterwards published a coloured plate in his *Flora Javae*, Orchidaceae, t. 49 (1858), but before this figure appeared, the orchid was already in English glass-houses, and Lindley in the *Botanical Register*, 1846, t. 47, as well as Sir William Hooker in the *Botanical Magazine*, 1850, t. 4492, had issued plates. The general colouring of the Tampin plant is nearly as in Lindley's and Blume's figures, *i.e.* a dull claret merging to yellowish white, with considerable mottling and streaking, all the colours dull except on the lip which is brightly coloured from claret at the edge of the side-lobes to a clear chrome yellow on the mid-lobe which ends in a deep claret tip. This lip is just like a saddle upside down, but with low spines as the figure shows where a saddle should be at its smoothest; Blume's name for the genus refers to the saddle-like appearance and to these low spines.

The flower is 5.5 cm. from the tip of the dorsal sepal to the bottom of the bucket, and 2.5 cm. across the mouth from tip to tip of the slightly recurved lateral petals; the opening into the bucket, disregarding the degree to which the lip blocks it, is 1.7



Flower of *Acanthephippium javanicum* in section ; h—the hinge of the lip.

cm. across. The lip is finely hinged (h. in the figure) obviously with the object of upsetting the balance of a visiting insect and throwing it against the sexual organs. By the slight projection of the lip from the mouth of the flower and by its conspicuous colouring it is the part offered to an insect for alighting. The drawing shows the saddle fallen forward as far as possible. The side-lobes of the lip which make the flaps of the saddle curve a little and would keep a visiting insect in the middle line and therefore just under the column with its sexual organs.

The interior of the bucket is more spotted than the exterior and deeper in colour. No free honey has been found, and no scent detected.

The flowering season is May, June and July. Up to four flowers have been seen open on the same raceme.

Blume's original locality, Gunong Salak, has been named. Lindley studied the plant in the nurseries of Messrs. Loddiges, and from his account the reader is led to suppose that Loddiges' plant

came from the same place, where Dr. J. J. Smith also has obtained it in recent years. Whence came the much more brightly coloured plant that flowered at Kew and furnished Sir William Hooker with his drawing, is unrecorded.

Dr. J. J. Smith records *Acanthephippium javanicum* as occuring on Gunong Salak, at Tjigombong and Bandongan, and on the island of Telo and in New Guinea (*Orchideen von Java,* 1905, p. 215).

STAUROPSIS BREVISCAPA, ROLFE.

In 1912 Mr. J. W. Anderson, then Assistant Curator of the Botanic Gardens, collected plants of this orchid in Sarawak and brought them alive to Singapore. They flowered very freely in April, 1916.

The plant rises to 3 feet, and bears many inflorescences of 2—6 flowers. The flowers are mustard yellow with rich umber brown markings. They face horizontally. The lip is very lightly hinged and hangs by its own weight: it is thick along the middle line, by reason of a ridge rising near the base, and continuing into a white point. It has brown lines on it, short and parallel, running towards the side lobes which are a little concave. The edges of the sepals and petals are crisped as in so many Vandas.

The following two sheets in the Singapore Herbarium are considered as of the same species:—

Sarawak without locality, *Sahib,* flowered in the Singapore Gardens, 23.4.14.

Bidi, Sarawak, *Mrs. Brooks,* Sept. 28, with the note. "This is a limestone orchid and occurs also at Kuop.

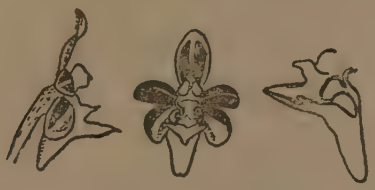
PHALAENOPSIS KUNSTLERI × SUMATRANA.

On May 4th, 1917, Mr. B. K. Saheb brought to the Botanic Gardens for opinion a flowering *Phalaenopsis* which he had obtained in the north of the Peninsula along with *P. sumatrana.* In foliage it exactly resembled *P. sumatrana,* but the flowers were white with a slight green flush, and marked sparingly with chocolate brown. The colouring thus was as in *P. Kunstleri,* Hook. f., but in shape it exactly resembled *P. sumatrana,* while upon the white petals and sepals the shape of the markings was as in *P. sumatrana,* Korth., though they were much less abundantly present. The sepals and side petals had rather the shape of those of *P. Kunstleri,* being shorter and more ovate than in *P. sumatrana.* Altogether there appeared in the specimen a certain amount of evidence for regarding it as a natural hybrid between the two named.

SACCOLABIUM (SARCANTHUS) SECUNDUM, RIDL.

Saccolabium secundum, Ridl. is a rather widely distributed orchid, occurring in the Himalaya of Assam, and southwards to Sumatra, Java and Borneo. Wallich's collectors, F. de Sylva and W. Gomez, obtained it in Sylhet, and Wallich apparently cultivated

it, for he caused a drawing to be made. Griffith in August, 1836, also obtained it at Sadiya in Upper Assam and made drawings and dissections of the flowers.



Flower of *Saccolabium secundum*, × 2½, viewed horizontally from the side, and from in front : and in vertical section.

Wallich appears to have intended calling it *Sarcanthus oxyphyllus*, but Lindley in helping Wallich with the distribution of his collection, by some accident transferred this name to another orchid, substituting *Micropora pallida*, but confusing two species. Griffith headed his description of the plant *Sarcanthus secundus* and McClelland published it after his death in the *Posthumous Papers* III, Notulae, 1851, p. 362. Ridley, in transferring the plant to the genus Saccolabium, rightly coupled Griffith's specific name into the compound *Saccolabium secundum*.

In 1895 under the editorship of Sir Joseph Hooker, Wallich's drawing was reproduced in the *Annals of the Royal Botanic Gardens, Calcutta*, vol. V, plate 77. Griffith's pencil sketch had appeared in 1851, but the plant as it grows in the Malay Peninsula has deeper colours in the flower than Wallich's plate or Griffith's description indicate for the Assam plant; and they are sligthly differently distributed. The annexed drawing shows its appearance, the black on the sepals and lateral petals representing a very dark chocolate brown, the white a pale greenish yellow. Griffith indicated that the Assamese plant has reddish orange where the Malayan plant has chocolate, and Wallich's drawing bears this out. The lip does not possess these colours, but it is lilac fading to white towards the base with yellow within the side lobes on either side.

The lip combined with the column is a very complex structure through not unique in the genus. The median crest of the limb is extended as a partition down the spur, which divides it almost completely into two, ending about mid length at the back and forming a short beak anteriorly. Above the point where the partition ends at the back is the caruncle which is bilobed and sits astride of the margin of the partition in such a manner as almost to close the way to the interior of the spur. Insects seeking honey must pass a proboscis either to right or to left of this caruncle and find it so directed into one half of the interior only. The honey is very abundant, and the walls of the spur are extremely succulent.

Undoubtedly there is not a little variation in the colouring of the flowers; and Dr. J. J. Smith in his *Orchideen von Java*, 1905, p. 604 states that the sepals and petals may be coloured light or dark brown with greenish blue margin and stripe down the middle.

In the Malay Peninsula as it appears to be found most freely near to the coast.

Saccolabium (Pomatocalpe) Arachnanthe, Ridl.

This orchid is one of the group for which Dr. J. J. Smith uses the name Pomatocalpe. A plant of it has been in the Botanic Gardens for a long time and flowered in April, 1916, and in May, 1918. In both years the month of February was dry.

The most curious thing about the flowers is that they face upwards—a rare occurrence in orchids. In the bud they are packed into a corymb. The flowers are white with a very faint lilac tinge, and with a few deep lilac spots towards the base. The edge of the septum which divides the spur from side to side is visible from the front of the flower over the brim of the spur and between the horns at the side, just as Dr. J. J. Smith figures it in *Die Orchideen von Java,* fig. cdlviii, for *Pomatocalpe latifolium.*

Flower of *Saccolabium Arachnanthe*, × viewed horizontally from the side, and from above.

The flowers fade pale green. They are pleasantly but not strongly scented.

The pollinating insects are unknown; but small bees are indicated by the shape of the flowers as suitable visitors; such insects would be expected to alight on the dorsal sepal and to approach the lip between the obliquely ascending lateral petals in the direction indicated by the arrow upon the figure. Such insects would pollinate the flower after having sought in vain for honey in the dry lower chamber of the lip, by backing over the sexual organs, and in the search for the narrow slit like a ⊥ which leads into the smaller upper chamber where the surface may be just moist.

Cypripedium niveum × Exul.

In the Gardeners' Chronicle, vol. 55, 1914, p. 326, Mr. Ridley described *Cypripedium Pereirae,* as almost certainly a hybrid of *Cypripedium niveum* with another species such as *C. Exul.* The native collector, who got it, has brought from the same part of the coast of the Siamese Malay States, namely the coast not far north of the Kedah border, another plant, which, while not exactly *C. Pereirae,* appears equally to be a hybrid of *C. niveum.* The plant in question fell into the hands of Mr. B. K. Saheb who grew it with *C. niveum* and flowered it in June, 1918.

The leaves of this plant are longer and firmer than those of *C. niveum*, attaining 14 cm. by 2.8. They spread and are dark green without the pale spots of *C. niveum*, but the green is nowhere quite of one colour, yet not waved. The tip is slightly unequally bilobed, and the keel at the back sharp. The single peduncle so far produced was about 10 cm. long, and carried one flower; it was densely pubescent, as also the bract, and the ovary. The fused lower sepals of the flower were 2.6 cm. long. The dorsal sepal when flattened was deltoidly subcordate, 3 cm. long and the same in breadth just above the base; but in life its margin was conspicuously undulate. The lateral petals were almost elliptic when flattened, 3.4 cm. long, and in life conspicuously undulate. All these were softly and rather densely pubescent on the back and the margins. The dorsal sepal was marked with lines of violet dots radiating from the base to mid-distance towards the margins, and with a faint lilac flush among the spots. The lateral petals descended but a little from the horizontal, and had a light violet streak right down the centre fading upwards and towards the tip. The rest of these organs was white. The lip was white and glabrous; nearly 3 cm. to the base of the bucket, slightly compressed laterally, longer in proportion to its width that of *C. niveum*, with the basal lobes well developed and strongly incurved. The column was thick, and its shield not at all cordate, but widened to a little beyond the middle, and then abruptly narrowed to a very short point; at its base it was suffused with very pale lilac, and in the centre with chrome yellow.

The chrome yellow comes from its niveum parentage, and so does the absence of isabelline tints in the flower, but the distribution of the violet to lilac colouring matter comes from the other less obvious parent.

It is the rule for hybrids between the white *C. niveum* and the isabelline coloured species of Cypripedium to be white. Many have been raised in gardens and are so; but *C. niveum* × *Exul* has never been raised. All the hybrids carry more or less of lilac pigment, and by its distribution suggest their second parent. In the case of the plant under discussion, the purple markings suggest *C. Exul* as regards the dorsal sepal, and *C. villosum* as regards the laterals petals. But the shape of the flower is more that of *C. Exul* than of *C. villosum;* and the finding of *C. Exul* in the same region almost establishes the parentage.

Further Evidence indicating that the Pigeon Orchid (Dendrobium crumenatum) flowers eight days after Heavy Rain, and on the flowering of Saccolabium Calceolus.

As the Rainfall statistics for the Botanic Gardens, Singapore, through the year 1917 have been given in the last part, it is convenient to make some remarks upon the flowering of the above-named two orchids in its connection with heavy rain, for the data are available for consultation.

In the Gardens' Bulletin, Vol. I, Nos. 11-12, 1916, pp. 400-405, evidence was produced to show that the Pigeon Orchid flowers about eight days after heavy rain in response to some factor or factors not isolated by experiment. The rainfall was there tabulated for thirty days in advance of thirty flowerings which occurred over the years 1913 to the commencement of 1917.

In the wet year 1917, the orchid flowered on an unusual number of days, namely.

January	17th, freely
„	18th, very sparingly
„	19th, rather freely
„	20th, very sparingly
February	19th, sparingly
„	25th, very sparingly in the Botanic Gardens, but in great abundance in Singapore town
March	20th, very abundantly
April	13th, fairly abundantly
June	2nd, very abundantly
June	20th, one flower only
July	7th, rather abundantly
August	11th, sparingly
„	14th, sparingly
„	31st, very abundantly,
September	6th, rather sparingly
„	27th, one plant only
November	8th, very abundantly,
December	11th, one plant only in the Gardens, but others in the neighbourhood of the Gardens,
„	25th, rather sparingly.

It is to be noted how frequent were these flowerings. Then if the reader will turn to the rainfall tables given on pp. 32-33 it can be observed that the rain which fell on the eighth day before six of the flowerings exceeded an inch or on the ninth day before eight of the flowerings, and that in one case only, out of the whole, did the rain of the eighth and ninth preceeding days fail to exceed half an inch; that one case being December 11th, when more than an inch and a half fell on the tenth of the preceding days. If we add together the rain in the way in which it was added on p. 403 of the first volume we find that on the nineteen days which were the tenth before the flowering 10.03 inches fell; on the nineteen which were the ninth 23.62 inches; on the nineteen which were the eighth 15.17, and on the others in approaching order successively 8.19, 6.75, 5.37, 8.97, 7.98, 7.95, and 8.23. Thus the ninth day before is suggested as the critical day rather than the eighth.

The same general result is obtained if the occasions of abundant flowering alone be considered. Perhaps higher average temperatures lead to the eighth day being the critical one; and lower average temperatures to the ninth.

Mr. H. N. Ridley pointed out some years ago that there is a similarity between the flowering of *Saccolabium Calceolus* and *Dendrobium crumenatum*, stating that the former flowers one day before the latter. This relation however cannot be expressed quite so simply. In 1917 *Saccolabium Calceolus* flowered in the Botanic Gardens, Singapore, on

February 24th,	one day before *D. crumenatum*,	by the Plant Houses
March 13th,	three days before „	generally
April 13th,	on the same day as „	by the Plant Houses
May 2nd		by the Lake
November 7th,	one day before *D. crumenatum*,	by the Plant Houses
„ 29th		generally and freely
December 9th,	two days before *D. crumenatum*,	generally and freely
„ 18th		by the Plant Houses
„ 22nd,	three days before *D. crumenatum*,	generally and freely

This flowering shows the following relationship to the rainfall, t. meaning a trace:—

12	11	10	9	8	7	6	5	4	3	2	1	day	before
.37	.45	.14	—	2.68	.48	.42	.02	—	1.72	1.61	.07	Feb.	24th.
.14	.59	.01	—	2.79	2.66	.79	.09	.02	.02	.92	.08	Mch.	13th.
—	.02	.12	.55	—	.17	—	t	—	.03	2.32	.51	Apr.	13th.
.04	—	.40	—	—	—	—	.02	—	.48	.35	.01	May	2nd.
—	—	—	.01	.38	.02	1.85	.02	—	—	—	—	Nov.	7th.
.01	.16	.03	t	—	.36	.03	.04	.02	—	.06	.07	Nov.	29th.
.06	.07	.63	.01	1.64	.08	.27	.15	.02	.82	.01	.02	Dec.	9th.
.02	.82	.01	.22	1.61	.63	.28	—	.18	.02	.40	.18	Dec.	18th.
1.61	.63	.28	—	.18	.02	.40	.18	.22	.27	.32	.05	Dec.	22nd.

Eight days before the first, second, seventh and eighth of these flowerings the rain was heavy, and on two of the four occasions the flowering was general in several parts of the Gardens. But it was equally free and general on November 29th and December 22nd when the last heavy rain before the flowering had occurred much earlier,—13 days in one case and 11 or 12 days in the other. Therefore although there must be some common cause predisposing the two orchids towards flowering, it is not clear at all exactly what it is. Observations from other localities would be welcome.

I. H. Burkill.

CONTROL OF DAMPING-OFF.

(The following taken from the *Agricultural News*, West Indies, of August 11th, 1917, Vol. XVI, pp. 254-255, is worth reading and digesting; for in Malaya, damping-off in one of the greatest troubles that a gardener has to contend with. The method recommended in it has been tried in the Botanic Gardens, Singapore; and so far there is nothing to be said against it except the necessity of teaching

the ignorant *tukang kebun* to handle the Sulphuric Acid respectfully; and as the use of burnt earth can be avoided in some measure, pecuniary gain is brought into sight).—*Ed.*

Damping-off is the term applied to the failure of seedlings due to their infection while in a tender state by certain soil-inhabiting fungi. The reason for the name is the association of the trouble with conditions of more or less excessive moisture, which favours the development of the parasite at the same time that it increases or prolongs the tenderness of the plants. Though not necessarily confined to seedlings crowded in boxes or seed-beds, it is amongst such that the affection usually appears and, by progressive infection, is able to cause extensive losses. Merely reducing the density with which the seed is sown is often sufficient, by permitting increased ventilation, preventing the drawing up of the seedlings, and making the spread of infection more difficult, to avoid or reduce the damage.

The longer the soil of the seed-bed has been in use and the more decaying animal or vegetable material it contains, the more likely it is to harbour fungi capable of causing damping-off. Heavy water-retaining soils are more favourable to the affection than those which are light and porous, and provision for rapid drainage is one of the most important precautions against it. Over-shading and close shelter, by maintaining humidity, increase the tendency to it; in these respects, as in the supplying of water, the conditions which favour the seedlings favour the disease, and a mean has to be struck between slow growth and loss.

The trouble occasioned by damping-off in these islands (West Indies) is not so great as might be expected by an agriculturist accustomed to temperate countries, where warm, humid weather, such as is associated with ideas of the tropics, is greatly feared in this connexion.

In the first place nearly all the staple food plants, sugarcane, bananas, tannias, dasheens, sweet potatoes, yams, cassava, are raised from cuttings of one sort or another. Cotton, corn and pulses, which are raised from seed, are planted a few seeds together, in their permanent positions in the open ground. Of agricultural as distinct from garden crops tobacco, onions, and limes, which are raised in seed-beds, have been the plants to suffer most in the West Indies from the affection under notice.

Notes on the subject, embodying the results of experiments conducted in the United States, were published in Volume XIII, of this Journal (p. 380). A bulletin recently received (*United States Department of Agriculture Bulletin, No. 453*), by Messrs. Carl Hartley and Roy G. Pierce, states the conclusions derived from further studies, made on coniferous seedlings.

The authors point out that the methods of prevention commonly adopted by nurserymen, such as the use of sandy soil, the use of sand or gravel for surfacing the beds, the provision of good drainage and ventilation, while often successful, do not avail

to prevent heavy losses under unfavourable circumstances, while the withholding of water often does as much direct harm as the affection which it is sought to avoid.

The use of imperfectly rotted manure, of lime, of wood ashes, and of a mixture of coal and wood ashes are indicated as having had bad effects.

The one means so far discovered which can be relied upon to give satisfactory results under any reasonable conditions is the disinfection of the soil. The question remains as to which of the various methods available for this purpose it is most convenient to adopt. The use of steam or of formaldehyde has been widely recommended, but these methods are so expensive as to be impracticable except for relatively small quantities of valuable material, as in green-houses or market gardens.

For the broader requirements of nurserymen the treatment finally adopted by the authors of the bulletin under review consists in the application in standard soils of three sixteenths of a fluid ounce of commercial sulphuric acid to each square foot of seed bed, applied in solution in water immediately after the seed is sown and covered. This has proved more reliable than the more expensive methods mentioned above.

The amount of water used to carry the disinfectant does not appear to be a matter of importance, provided that the necessary amount of the acid is applied to each unit of area. The quantity used by the authors varies from 1 pint per square foot when the soil is wet to 2 pints when the soil is dry. There is a possibility, especially in light soils, of a concentration of the acid by evaporation to a strength injurious to the root-tips, which in practice has been found to be completely avoidable by watering the beds frequently during the period of germination. When the root-tips have penetrated to a depth of half an inch this is no longer necessary.

There are differences in the amount of acid required for successful results in different soils. In sandy soil which was probably somewhat alkaline, a heavier application, one-fourth to three-eighths of an ounce, was indicated. In a fine sandy soil which was probably already acid, chemical injury to seedlings was more difficult to avoid, and reduction of the acid to one-eighth of an ounce was advisable. On heavier soils the use of five eighths of an ounce produced no injury, and reduced losses by damping-off to less than 1 per cent.

On a soil with a high carbonate content, evidenced by a vigorous effervescense when the acid was applied, the method was found to be ineffective. On this soil the use of copper sulphate, one-fourth ounce per square foot, gave good results. This substance was applied in the same way as the acid, and the same precaution to avoid chemical injury was found necessary.

An interesting indication was given by the experiments of the effectiveness of cane sugar, 2½ oz. to the square foot, in the control of damping-off. The authors point out that if some un-

refined sugar-bearing substance were available, it is possible that for certain soils the application of sugar would become an economically satisfactory treatment. Experiments on this subject might well be carried out in the West Indies.

There are secondary advantages to be expected from sulphuric acid disinfection which may be of considerable importance in some cases. Under appropriate circumstances a larger germination percentage is secured, the number of parasites in the soil is reduced, and the well-known effect of disinfection on fertility results in increased growth. Another valuable effect has proved to be the reduction of weeds owing to the greater susceptibility of their seeds.

In considering the application of the methods to local conditions, it is necessary to emphasize the fact that the results stated have been obtained with the seedlings of a definite group of plants, the conifers. It will be necessary to find by experiment how far they are transferable to the seedlings of unrelated plants. In view of the difference of soils, moreover, such experiments must be carried out in the situation where the seedlings for which it is proposed to adopt the method are raised.

Some hints are given as to the method of handling the acid. It should always be dissolved by pouring it into the water; reversing the process may cause a serious accident. The solution should be made up in wooden or earthen containers and applied with watering cans which have been coated inside with paraffin wax. Boots may be protected by being heavily greased. Wooden containers should be washed out, immediately after use, with water containing washing soda.

W. N.

PROPAGATION OF HEVEA FROM STAKES.

On page 251 of the first volume of the Gardens' Bulletin reference was made to the difficulties experienced in propagating *Hevea brasiliensis* by means of cuttings. Experience in Ceylon and in the Malay Peninsula was quoted; and Mr. Petch's suggestion that Thwaites had been deceived when he claimed it to be easy was cited.

Fresh experiments were then made with cuttings from young twigs, without success; and when it happened, in 1917, that a big wind destroyed many rubber trees in the Economic Garden, stakes were cut from them for supports in the yam beds, so that the misfortune of losing many rubber trees gave the opportunity of trying propagation from branches 1—2 inches in diameter.

These branches were cut diagonally with a sharp knife at the end, thrust into the ground, and wired together at six feet in the way which is seen in Plate VI of the first volume of the Bulletin Nos. 11-12 (opposite p. 394).

Out of a total of 1489 stakes so taken, 18, or 1.21%, took root and produced leaves.

The weather was wet when in January and February the stakes were set in the ground.

I. H. Burkill.

THE ESTABLISHMENT OF THE BOTANIC GARDENS, SINGAPORE.

The year 1919, the centenary of the founding of the settlement of Singapore, brings in the sixtieth year of the Botanic Gardens; and their early history is becoming obscure. Moreover the records are only in the two older Singapore newspapers, which it is laborious to consult, and of which single files exist. These are reasons enough for reproducing here six reports, and for bringing them into one view by a brief introduction, with quotations from the old papers.

The Straits Times under the date 12th November, 1859, has the following paragraph:—

"We understand some of our enterprising citizens have resolved to establish a Floricultural and Horticultural Society, which will receive our hearty concurrence and support. This will be the third attempt to organise a really useful association, and we trust it will succeed."

Who these citizens were is not recorded: but from subsequent papers it appears as if Mr. J. E. Macdonald and Towkay Hoh Ah Kay, better known under his trade name of Whampoa, were two; and it is fairly apparent that the Governor, Colonel O. Cavanagh, had been consulted and had offered his support.

Although called Floricultural and Horticultural in this first notice, Agriculture was in its purview from the very start, its proper title being The Singapore Agri-Horticultural Society.

Within six weeks from this notice the Government of the Colony, glad exceedingly that some of its 45,000 acres of abandoned lands should be cultivated, had provided for the Society's operations through an exchange with Whampoa, by giving a piece of low-lying Government land in the River valley to him in return for an area of 56 acres (subject to a subsequent slight rectification) between Napier, Cluny and Garden Roads, the last a track only at the time (Straits Times of 24 Dec., 1859). The Government further promised convict labour within its power of giving: and the Society at once set to work to raise funds for superintendence, stores, tools, seeds, etc.

Members were enrolled on paying $25, and retained membership by a monthly subscription of $1 commencing on January 1st, 1860. Others might enjoy the use of the Garden, if residents, by paying $1.25 per mensem as second class subscribers. Strangers, if not from the very first, at least from an early date, were admitted into the Garden free.

Having got a membership of 77, the Society was provided thus with over $1900 as capital; and the subscriptions, we are told, averaged $74.25 over the first eighteen months (Appendix 2).

The outline map produced here, was drawn with the use of contemporary documents in the Land Office; it gives the whole present area of the Botanic Garden, the Economic Garden excluded, with the three original properties out of which it is made, marked separately

by letters N. K. & A. The areas K. and A. in the map were those which were put at the service of the Agri-Horticultural Society in 1859; the area N. was added in 1866. The chief part of the area of the Garden is seen to be made up of K, which had been granted by the administration in 1852 to one William Graham Kerr.

On the east of this Kerr property was property granted by the administration to one Gilbert Angus in 1848, and on its west property granted similarly in 1853 to one William Napier. When the Cluny road, now a Garden boundary, came to be constructed, it cut through a part of the Angus property, and a part of the Kerr property; the edge of the Angus property, marked A on the map, passed into the same ownership as the Kerr property, while the part of the Kerr property cut off (K2) passed away from the ownership. Again later when the Garden Road came to be made in 1866, it cut a strip off the property of the Napier grant which the administration acquired from Adam Wilson who had bought it from Whampoa and he from Napier, and this strip marked N. on the map, was attached to the land in the hands of the Agri-Horticultural Society. The records show that these lands had changed hands several times within the few years from the original granting; and as we know that in the middle and later part of the fifties, speculation in property about Tanglin was considerable —such landed property as was suitable for country houses,—it is fairly evident that the owners were not in the course of farming what they had come by, but were holding it up for such an

appreciation as accrued considerably in 1856, 1857 and 1858. A surmise only can be made that the southern part of the Kerr property had once been cultivated—say for gambier,—and had reverted to blukar: but virgin forest certainly existed on the northern part, for that forest still persists—a most valuable asset to the Gardens, and there is a little more of it just outside the Gardens on that part of the Kerr property marked in the map K2, which, as said, on the making of Cluny Road was cut off from the rest. The trees growing on both bits of land attest to the forest being primitive: for there are among them such as do not return through blukar, into forest younger than a hundred years. The eye of Sir Stamford Raffles for instance, therefore, saw forest where we see it still. But south of the Bandstand hill there seems to be scarcely a tree which could have been standing in 1860.

We are told (Appendix 2) that the Society spent $1448.10 out of its capital on the clearing of the southern part of the land and on roading.

The first roads made appear to have been what we now call the Office Gate Road and the Ring Roads, the Liane Road, and the Maranta Avenue. The present Main Gate the Society did not make their principal entrance; nor do they seem at first to have made the Main Gate Road. That Road was a later construction, as the abruptness of its junction (at d. on the map) with the first system of drives indicates. The hollow where the lake now is, must have been a swamp down the centre of which the boundary of the Kerr property, (from 1859 to January 1866 the boundary of the Society's property), made the straight line a-b on the map.

Probably for the sake of getting all the influence possible, the Committee was made very large. Fourteen sat on it, with His Honor the Governor as Chairman, and with Mr. J. E. Macdonald as Treasurer: and on September 13th 1860, this large Committee was enlarged to twenty one, five in rotation taking control of affairs along with the Treasurer, who henceforward was to be called Secretary as well.

When the first Committee of fourteen was appointed, and who were elected to it, are unrecorded; but in the first appendix (below p. 64) we find the names of eight who were present at a Committee meeting, together with the names of seven others who were then added to the Committee to make up the number to twenty-one.

Though hoping to benefit local agriculture, the Committee set as its first object the creating of a pleasure garden, as an alternative to the Esplanade, which was then the only resort for the evening drive. The Committee's efforts consequently began by providing a place where a band could play; and the hill top which is 109 feet

*Some trees on the Bandstand hill break the continuity of the terraces, as if spared when the terraces were made; and the southernmost of them are on the west a tree of *Artocarpus rigida*, the Monkey Jack, and on the east a tree of *Artocarpus lanceaefolia*. Everything south of them except the Sagos by the Lily-pond and perhaps two other trees, appears to have been planted since Gardens were laid out.

above sea level was chosen.* Terraces were planned flanking Ring Roads made on it; and through 1861 work upon them was in progress. This is what a visitor from Penang wrote in the Penang Gazette, "I rode over to the new Botanic Garden. By the time it is finished it will be a very nice place. From what I saw of it, part is intended to be laid out in the common terraced English style with drives round the grounds which are of some extent." The Singapore Free Press of January 1862 in reviewing the year then just finished, stated that the progress made in the Garden was considerable.

In 1861, if not also in 1860, a regimental band played in it; so that it had become an evening promenade. The band played once a fortnight (Appendix 2), and the day was at one time a Monday (Singapore Free Press of August 21st, 1862) then changed by public request to a Saturday (Singapore Free Press of September 4th, 1862),—the second and the fourth Saturdays in each month. But it is evident that the terraces were not completed, for in August 1862, work on them was still proceeding (Appendix 2).

It is recorded that in 1862 the Society engaged two Chinese gardeners to grow vegetables, hoping soon to be able to distribute plants and seeds among the members (Appendix 2); but reading in the Singapore Free Press of November, 1863 a regret that the Society was not able as yet at that date to supply fruit and vegetables, it is evident that the experiment went amiss.

While the Society's Garden was thus being made, the Society organised Flower shows in the hope of encouraging local cultivation. The first show was advertised in the Singapore Free Press of May 11th, 1861 and July 20th, 1861, and took place upon the Esplanade on the afternoon of Saturday, July 27th, 1861, in a tent "fairly decorated with bouquets of cut flowers from the Garden" and from exhibitors.

A second show was held in December, and others followed in subsequent years.

The Society had obtained the part-time services of Mr. Lawrence Niven as Superintendent. It was easy for him to combine this work with his other work, for he was employed as Superintendent of an adjoining nutmeg plantation; and he asked very little for it. It is quite evident that he did his part well, for he earned the Committee's thanks "for his taste in laying out the Garden" (Appendix 2), and Buckley (Anecdotal History, Singapore, 1902, ii. p. 732) says that he made the Garden attractive by large beds of pretty flowers; and further praise is given to him in the Gardens' Guide published in 1889.

The Government provided ten convicts for the Garden; and they were housed in lines built, if not at the very first, at least before 1866, up against the Napier property where the Lake now is. The Committee employed a further ten men, and added again another ten in 1863 in order to push on the work. But the expense of this free labour was more than the normal revenue of the Society could

* There is a point in the Gardens jungle recorded as 108 feet above sea level: and the Director's house is recorded as at 116 feet.

bear; whereupon thirty-one members came forward with donations of twenty-five dollars each (Appendix 3), and then again in the next year another fourteen members (Appendix 4). The further to add to the Society's funds a Fancy Fair was next organized in conjunction with a Flower Show, which took place on December 28th, 1864, and then again another Fair was held in 1866.

Although a hope had been expressed of dispensing with the second gang of ten free labourers, the report for 1864 (Appendix 4) shows that 17 men were being employed under a mandor, and that the Government had been able to increase the number of convicts to fifteen. It was under these circumstances that the second fourteen subsidiary donations were given.

The Bandstand Hill at the end of 1862 or in 1863 had become so far transformed that it was decided to turn attention towards the southern corner and to construct a new entrance "at the nearest part to town" where the present Main Gate stands. The Society somehow still possessing a little bit of land, cut off from the Kerr property in the making of the Cluny Road, and for that reason of no real use to them, exchanged it for considerations with the Nassim estate, one of which was that a corner of Nassim land should be thrown into the Napier and Cluny roads at their junction in order to improve the approach to the new gate. This was done.

The realignment of Garden Road had meanwhile been under the consideration of the Government, and as its construction promised to add a narrow strip to the Garden along its west edge, the making of the Lake, as it now is, became possible. This possibility may have been foreseen for two or three years, for the Main Gate Road which runs along the Lake bank had assuredly been laid down when in 1864 the new gate was opened, and there are no signs of any subsequent realignment to fit its course to the lake; but that the Lake was not part of the plans made in 1860 must be the case, for all the land was not in the Society's possession, and the Main Gate Road which takes visitors to the Lake, as said on p. 57, was not in the first plans. The Gardens were in fact laid out in four stages, each more or less independent; first there was the Band promenade with an approach from Cluny Road, and a means of driving through to the Rogie gate or the Garden Road; next, hinged on to the Bandstand to its south, was made the Herbarium Ring Road and its connecting paths, very carefully and symmetrically planned; then came the Main Gate, with its road; and lastly came the Lake, depending for its existence upon the acquisition from Adam Wilson in January, 1866, by Government of a bit of the Napier property. The Government supplied convict labour for work on the lake; but this had to be supplemented by free labour (Appendix 5).

Meanwhile Lawrence Niven found that the service demanded from him by his growing charge was inadequately paid for, and asked for more than he was receiving. The Committee considered it his due, but not feeling certain of having the means of granting it; they applied in August, 1865, to the Government for an allowance of fifty dollars per mensem, being the amount that they found

would retain Niven; and the Government sent the application forward to India for favourable consideration. A long interval passed with no reply, and the Society becoming very insistent, the Governor took it upon himself 13th July, 1866, to grant the sum asked for with effect from May 1st, 1866, subject to approval, only to find himself overruled from Simla by an order which he received the very next day. Yet somehow the Society did get this grant of $50 and in the same year, it being the first direct payment on the part of Government to the Gardens (vide Appendix 5).

There is a statement appended to the report of the Society for 1866 which is not reproduced here, wherein the names of the members of the Society are given and the amounts of their donations; we learn from it that 133 had joined, paying their $25 entrance fee and some of them giving another $25 later. We know that 77 of these were original members or members who had joined in the first year, and that 9 new members were obtained in the first half of the second year. If we distribute the balance of 47 over the remaining five and a half years, say thus, 5 for a half year, 8, 8, 8, 9, and 9; and collect together the other declared sources of income, assuming this only that the first Fête brought in $1000, we find that the Society obtained funds as follows:—

year	entrance fees	special donations	proceeds of fêtes	subscriptions, gate money, etc.	Total as recorded
1860	$1925	$—	$—	$624	$2348.75
1861	350	—	—	1296	1646.50
1862	200	—	—	985	1185.50
1863	200	775	—	945	1920.00
1864	200	350	—	1335	1884.75
1865	225	—	1000	2140	3364.62
1866, 10 months only	225	—	1717	3135*	5079.41

The increasing figures were evidently held by the Committee as justifying larger expenditure: they considered that they were beginning to get a return on their outlay, and would on a yet larger outlay. The Governor, moreover, in his Progress Report (dated 1867) remarked the taste in which the Society's land had been laid out. With a great faith in their mission, they proceeded to stabilise the undertaking; they raised Mr. Niven's pay again to retain his services (Appendix 5); they obtained from Government a grant in perpetuo of the land§ which they had been holding by its goodwill, so long as it should be used for public purposes; and to provide a site for a house for their Superintendent, and for other purposes they bought on March 9th, 1866, upwards of twenty-five acres of land† of the old Napier estate from Adam Wilson, who had bought it from Whampoa,—the land N2 on the plan. This exhausted their funds, leaving nothing for building: but they raised $1500 by a mortgage (Appendix 5).

* includes $250 from Government *i.e.* $50 p.m. May to September.

§ 55 acres 3 roods and 28 poles.

† 24 acres 1 rood and 19 poles.

Up to this date the Society had had two Secretaries, firstly Mr. J. E. Macdonald, and secondly Mr. E. J. Leveson. Both had somehow through considerable difficulties, procured funds for the Society's Garden, and worked most assiduously, especially the second. From its foundation to 1867, when he retired, Major-General Cavanagh had showed the greatest interest. He took the chair at the meetings and was active with all the help he could give. The public to this date had put $17,430 into the creating of the Garden. The third Secretary Mr. C. H. H. Wilsone was not so fortunate. He entered into a contract* in 1867 with a Chinamen for the building of a Superintendent's house,—now the Director's house,—for the sum of $2400, and left the Society with a debt of over $700 being largely the difference between the sum raised by the first mortgage and the cost of the house. The last appendix here printed shows that in his non-extant report for 1868 these debts were overlooked, and a very false idea of security presented.

The Committee in 1869 when they realised their position asked and prevailed on the Government to allow them one hundred dollars monthly instead of fifty: and Sir Harry Ord, who was Governor, made a bargain that in return the Society should exhibit in the Garden living economic plants; for he had noticed that travellers making but a short stay would seek in vain for gambier, pepper, and other similar useful objects whose cultivation was no longer carried on near to the town. The better to watch the spending of the increased grant, which, consequent upon the falling off of subscriptions made 43 per cent of the Society's income, the Governor decided to appoint a member on to the Committee officially and chose Mr. H. F. Plow, Clerk of Councils, to represent him. At the same time he suggested the formation of a Zoo as an additional and educational attraction, like the economic plants: and he offered to present some animals.

The transactions of the years which follow between 1870 and 1874 are obscure, because the Agri-Horticultural Society went to sleep again. In a speech upon the Budget for 1875, made on December 18th, 1874, and reported in the Singapore Daily Times, of December 24th, 1874, Dr. R. Little stated that the Society had not carried out its part of the compact with the Government to grow economic plants, and that Committee and Management had alike lost interest. The Committee indeed had failed to raise adequate funds, except by increasing the 8% mortgage on its property to $4000. When in August 1874 this had been run through and the Treasurer found himself with a very adverse balance, a meeting was called which resolved:—"That the Honorary Secretary be instructed to acquaint Government with the willingness of subscribers to hand over the Agri-Horticultural Gardens for future maintenance, reserving to subscribers the same privileges that they now enjoy." This resolution Mr. R. Campbell, as Secretary, forwarded to the Colonial Secretary on August 13th, 1874.

Three months earlier, on May 14th, 1874, the subscribers to the Raffles Library had passed a similar resolution, praying the Government to take over their property with their debts, and to

* The specifiation and approximate plans are in the Gardens' records.

maintain the Library: and this request the Government had acceded to, and had appointed a very strong Committee, with Dr. Robert Little as Chairman, and Dr. N. B. Dennys as a member, to carry on. The Government, it happened, had been asked just before this by the Secretary of State if their control over the Library and over the Gardens was at all commensurate with the large sums of money that were being spent (at the time mostly on the Library). Change thus came from two sides: for both institutions had asked the Government to take them over; and of both institutions the Secretary of State had enquired if the Government was controlling them. The subscribers to the Library had acted first: the change was made promptly, and the new Committee immediately got under way. They engaged the services of a Dr. James Collins, who had come eastwards with recommendations from the Secretary of State, Sir Joseph Hooker and others, on a salary of $150 per mensem, to travel and investigate, to collect for the Raffles Museum; and to his duties was added that of getting together objects for an Exhibition in London: at the same time he was to carry on the Committee's correspondence, accounts, etc., in Singapore. Then when the members of the Agri-Horticultural Society made their petition, the Governor requested this Committee, if they could, to take charge also of the Garden; and they consented to do so. Thus the Garden passed temporarily under the same control as the Raffles Museum.

We find in the speech made upon the Budget estimates for the next year by Dr. Little, already referred to, and in some letters preserved in the Library the Committee's proposals for the future. Dr Little in these explained that it would not be advisable to add to Dr. Collins' work, but that another officer should be obtained from Britain, who could join Dr Collins in his explorations, the results of the two working together, bringing "immense gains to the scientific world."

The Governor now advised the Secretary of State that legislation would be necessary, for the Garden was property vested in the Vice-President and Treasurer of the Agri-Horticultural Society, and therefore could only be held for them by the Raffles Library Committee; and an act was needed that they might be transferred completely to the Government. For the purpose one was drafted immediately, but not put through. Meanwhile reorganisation was commenced; on the recommendation of the Committee, Government agreed to the retention of Mr. Niven on his pay of $80 per mensem with the title of the Manager, giving him permission to undertake besides their work other business; and the proposed Superintendent was sought from England by the Committee in correspondence with Sir Joseph (then Dr.) Hooker, as Director of the Royal Gardens, Kew. This Superintendent, the Committee stated, was to be a practical as well as a systematic botanist, and to travel in the Malay Peninsula not a little for the purpose of investigating its vegetation. At the same time an officer, found locally, was appointed to the charge of the animals in the Garden. Dr. Little obtained in the place of the sum of $1200 which was passed by the Government in the estimates of 1870, 1871, 1872, 1873, and 1874, as a grant to the

Botanic Garden, in 1875 $11,324; and in the three years following the Government budgeted annually $7580 for the Botanic Garden and $2400 for the Zoological Garden.

In the Singapore Daily Times for December 19th, 1874 and for the following days, there may be found an advertisement of the taking over of the Garden by the Government and of it being open now to all under the rules given, the right to receiving cut flowers, etc., being reserved to the subscribers within the Garden's means of supplying them.

At this date the Garden they may well have been quite a pleasant place to wander in,—a park in fact, but they had no scientific value whatsoever, for the number of species of plants cultivated was about 500 (Guide, 1889) and the animals were only a small collection of birds. The Society had lost way, though in the few years before they had been useful at times to the Government for the supplying of seed-coconuts to Mauritius and of seed of cocoa, cloves and pepper to Queensland, in answer to official requests from those colonies; but it would seem that the staff of the Garden collected what was needed from outside; and the Garden itself played no part in the service.

Then to the Library Committee in answer to the request for a Superintendent, Sir Joseph Hooker sent out an energetic, but very young man, in James Murton, who, arriving in Singapore in October, 1875, with a large supply of new plant-introductions, chiefly from Ceylon, converted with these and with later supplies from Kew, Mauritius, Brisbane, etc., the Agri-Horticultural Society's park into a working Botanic Garden; while William Kröhn, employed by the Committee, built up the collection of animals. Lawrence Niven now took leave, and died while away. His work,—the landscape gardening and terracing,—had been well done, so well done that little has been altered since: whether the plans were his entirely, or were not, is unrecorded: but it is evident that he greatly influenced them: and the smallness of the pay given to him suggests that he undertook the work largely for the love of it.

I. H. Burkill.

APPENDIX 1.

From the Singapore Free Press of 13th Sept., 1860.

A meeting of the Committee of the Singapore Agri-Horticultural Society was held on the 28th ultimo, the Honourable the Governor, President of the Society, being in the chair. The following members were present:—Messrs. J. d'Almeida, C. H. Harrison, Whampoa, C. R. Rigg, J. E. Macdonald, M. F. Davidson, and Capt. Burn. The Treasurer's accounts, showing a balance of $36.49 in favour of the Society, having been examined and passed, the following resolutions were adopted:—

1. That the Treasurer be requested to collect the monthly subscriptions from the 1st January last and in future that they be collected quarterly in advance.

2. That the members of the Committee be augmented to twenty one members, and that the following gentlemen be requested

to act so as to make it up to that number, viz. Messrs. Jose d'Almeida, James Murray, Tan Kim Seng, W. Paterson, W. Mactaggart, J. H. Campbell, and C. H. Wilsone.

3. That the Committee be divided into four Subcommittees who will by turns undertake the general management of the Society for three months at a time, and that the following gentlemen be requested to form the first Subcommittee from the 1st September next:—Messrs. C. H. Harrison, M. F. Davidson, C. R. Rigg, J. d'Almeida, and Captain Burn.

4. That the Committee as early as possible put themselves into communication with the Botanical and other Societies of Calcutta, Batavia, Mauritius, Penang, and other places for the purpose of obtaining supplies of plants and seeds.

5. That a Show of Flowers, Vegetables, and Fruit be held in March next, and that the Subcommittee for the time being make arrangements for the same.

6. That to enable the Society to avail itself of a gang of convicts as sanctioned by the Government, the necessary accommodation be provided for their reception within the limits of the Garden.

7. That Mr. Macdonald who has so kindly acted as Treasurer to the Society since its formation be also requested to undertake the duties of Secretary,—a combination of the two offices being considered desirable.

8. That Messrs. Whampoa and Tan Kim Seng be requested to afford the Society their valuable assistance in inducing their countrymen in Singapore to join the Society.

9. That each successive subcommittee on being relieved be requested to furnish a brief report of their proceedings to be laid before a quarterly committee meeting.

APPENDIX 2.

From the Singapore Free Press of August 15th, 1861.

This being the first general meeting since the formation of the Society in November 1859, the Committee of the Society desire to report proceedings to the Subscribers.

There are now 67 first class subscribers and 8 second class subscribers. Since the formation of the Society, 19 first class subscribers and 1 second class subscribers have withdrawn or left the Settlement. In the above 67 there are 9 new members since the commencement of the year.

From the account current to 30th June, produced by the Treasurer, there appears to be a balance on hand of $167.01.

The monthly income from subscriptions is $74¼ while the expenditure has averaged $176 per month, for a period of 18 months. This sum, however, includes $1,448.10 paid for contract work for clearing land, making roads, and erecting gate-posts, and bridges, leaving about $90 per month to the general working expenses of the Garden, being an excess of expenditure over receipts of 15¾ per month. The bringing of the Band to the Gardens once a fortnight

involves an outlay of $14 per month, but your Committee think that it is advisable to continue this expense, as the presence of the Band is a source of attraction to a considerable number of the community, and has added somewhat to the number of subscribers, and it is expected it may be the means of adding still further to the number.

There are now employed on the Garden a mandore and 10 coolies, and the Government allows a gang of 10 convicts. The quantity of work performed may appear to be less to the subscribers than they may have expected from the number of men employed, but the heavy nature of the work, which has consisted mainly of the formation of the very extensive terrace near the bandstand, fully accounts for this.

The first show was held on the 27th July, and although the products shown were not numerous, they were certainly as many as could reasonably have been expected. As a first attempt, and seeing the interest taken by the natives on this occasion, your committee are sanguine that much good will result from it.

Two Chinese gardeners have lately been engaged for the purpose of cultivating vegetables under the Superintendent, and it is hoped that in a few months the sale of vegetables will be a source of profit to the Garden, as well as a stimulant to men of their nation to rear a better cultivated vegetable; and to introduce a greater variety than the European community have hitherto enjoyed.

Your committee are much indebted to Mr. Niven Jr. for the taste displayed in laying out the Garden, and for the attention he has given generally.

Supplies of seeds have been received from the Agri-Horticultural Society of India, and also from England and from the Botanical Gardens of Batavia. Two boxes of plants and orchids and several contributions have been made by residents. And your committee hope ere long to be in a position to distribute plants and seeds among the subscribers, and cannot conclude this their first report without congratulating them on the success of the Agri-Horticultural Society of Singapore.

APPENDIX 3.

From the Singapore Free Press of Nov. 19th, 1863.

A general meeting of the Agri-Horticultural Society was held on Thursday the 12th instant (November 12th, 1863) at the Exchange Rooms, His Honor the Governor in the chair.

The Honorary Secretary read his report and the same was passed and approved.

The Treasurer submitted his report showing a balance in favour of the Society of $284.92, out of which the expenses of November and December have to be paid.

He at the same time brought to the notice of the meeting that out of 95 original members 4 have left Singapore, of these remaining 31 have already paid a second donation of $25 and this payment alone has prevented the Society from becoming insolvent.

The total income for the first half-year was $634.50 and the expenditure $762.42 showing a deficit of $22 per month, whilst for the current half-year the income is likely to be $522 and the expenditure $822 showing a deficit of $50 per month. This deficit has been mainly caused by the 10 extra coolies which it has been necessary to retain in order to complete the work now in progress. These however will in all probability be discharged early next month when the income is likely to be nearly enough to cover all Expenditure with the exception of the carriages for the Band.

The Treasurers report was then passed and approved.

The following resolutions were then proposed and carried.

1st Resolution—Proposed by Joachim d'Almeida, Esq., seconded by Captain Protherce.

That the following Gentlemen be requested to form the Committee for the ensuing year:—

Jose d'Almeida, Esq., C. P. Lalla, Esq., Captain Macnair, J. Murray, Esq., C. R. Rigg, Esq., D. Rodger, Esq., H. M. Simons, Esq., Syed Abdulla, Esq., Tan Kim Ching, Esq., Whampoa, Esq., E. J. Leveson, Honorary Secretary and Treasurer.

2nd Resolution—Proposed by H. M. Simons, Esq., seconded by J. d'Almeida, Esq.

That an application be made to the Government in hopes of being able to obtain further assistance in the way of Convict Labour.

3rd Resolution—Proposed by the Honourable the Resident Councillor, seconded by Captain MacNair.

That with a view of increasing the members the monthly payment of the Second Class Subscribers be reduced to 50 cents, and the privilege hitherto granted to the Public of resorting to the Society's gardens on 3 days a week be withdrawn and the Gardens hereafter to be open only to Members, Subscribers, and Strangers, and Messrs. J. Little & Co. are kindly requested to receive Subscriptions and Donations.

4th Resolution—Proposed by H. M. Simons, Esq., and seconded by E. J. Leveson, Esq.

That the best thanks of this meeting be voted to His Honor the Governor for his kind assistance in taking the chair and for his valuable suggestions.

APPENDIX 4.

From the Singapore Free Press of Nov. 17th, 1864.

The annual meeting of the Members of the Agri-Horticultural Society was held at the exchange rooms on Thursday November 10th, 1864.

The Honourable Colonel Orfeur Cavenagh, Governor of the Straits Settlements, in the chair.

The Honourable the Governor read the annexed report of the Hon. Secretary and Treasurer.

After some preliminary remarks from the Chairman, the following resolutions were put to the meeting and carried unanimously.

1. Proposed by the Honourable the Governor, seconded by H. M. Simons, Esq.

That the accounts and report of the Honorary Secretary and Treasurer be passed and confirmed.

2. Proposed by the Honourable Col. Macpherson, seconded by C. H. Wilsone, Esq.

That the following gentlemen be requested to form the Committee for the ensuing year.

S. J. G. Jellicoe, Esq., C. P. Lalla, Esq., Captain Macnair, Captain Mayne, J. Murray, Esq., D. Rodger, Esq., H. M. Simons, Esq., Tan Beng Swee, Esq., Lieut.-Col. Warden and Whampoa, Esq.

3. Proposed by the Honourable the Governor, seconded by the Honourable Col. Macpherson.

That E. J. Leveson, Esq. be requested to act as Honorary Secretary and Treasurer for the ensuing year.

4. Proposed by the Honourable Col. Macpherson, seconded by E. J. Leveson, Esq.

That the proposition of the Committee to increase Mr. Niven's salary to $50 per mensem be carried out.

5. Proposed by H. M. Simons, Esq., seconded by J. S. Atchison, Esq.

That this meeting approves of the decision to hold the proposed Fête and Fancy Fair at the Mess House, Tanglin, in preference to the Gardens.

6. Proposed by H. M. Simons, Esq., seconded by Lieut.-Col. Warden.

That the best thanks of this meeting be presented to His Honour the Governor for taking the chair, and for the kind assistance he has always rendered, and the interest he has always taken in the Society.

Report.

The current account to the 30th June last, shows a debit balance of $66.76, and that to the 30th of last month, a balance in favour of the Gardens of $366.15, which will cover the ordinary expenses to the end of the year.

At the last annual meeting it was proposed to reduce the 3rd class subscription to 50 cents per month, but as this arrangement was not availed of to any extent, the committee decided to give up the 3rd class subscriptions altogether.

The monthly income from subscriptions during the first six months averages $100, and the expenditure $154, and during the present half-year the subscriptions have amounted to $144 against an expenditure of $184 per month. To meet however, the surplus of expenditure over income there have been fourteen donations of $25,

The officers of the 34th Regiment having kindly volunteered to subscribe $80 a year to the Society, the Committee felt justified in asking them to allow their Band to come again to the Gardens once a fortnight, a boon which has been highly appreciated by the subscribers.

We have now one mandore and 17 coolies employed regularly in the Gardens, and the Government allow 15 convicts, part of whom are employed in laying out the new grounds.

Mr. Niven has been unremitting in his attention and superintending the Gardens generally. He has shown great taste in carrying out the improvement going on, and it seems now quite time for the Society to show their appreciation of his services by an increase of salary, his present one being barely sufficient to cover the expenses consequent on his daily attendance; and the Committee recommend that his salary be increased to $50 a month. Considerable attention has been paid to the drainage, and a new grand entrance has been commenced at the nearest point to the town, the whole of which expense has been borne by the Government.

A strip of land belonging to the Nassim estate, and bordering on the Gardens has been exchanged for a similar piece of ground which formed part of the Gardens, but was of no use as it lay on the opposite side of the road, and to enable us to widen the principal approach, the Trustees of the Estate kindly allowed the corner of the Castle property to be thrown into Napier and Cluny Roads.

Although the residents have subscribed very liberally to the Gardens, it was found impossible to complete the laying out of the new ground without further means, and the Committee therefore have decided to hold a Horticultural Fête and Fancy Fair on the 28th of next month, when they expect that a considerable addition will be made to the funds of the Society.

In addition to promised contributions from the residents of Singapore, orders have been sent to Europe, India, China, Manila, and Japan for articles for sale the outlay for which, amounting to $1000 has been guaranteed to the Treasurer by the Committee.

APPENDIX 5.

From a Printed Paper Distributed to the Members of the Society in 1866.

Proceedings of the Annual Meeting of Subscribers.

The Annual Public Meeting of Subscribers to the Singapore Agri-Horticultural Society was held in the Exchange Rooms on Monday, November 19th, 1866.

The Hon'ble the Governor in the chair.

The Report was read by the Hon'ble the Governor.

Proposed by the Hon'ble the Governor, seconded by W. Paterson, Esq., that the Report now read and the Treasurer's accounts be passed and confirmed.

Proposed by Captain Protheroe, A. D. C.; seconded by Jose d'Almeida, Esq.: that the following gentlemen form the Committee for the ensuing year.

Brigadier Ireland, Colonel Cooks, J. Bennett, Esq., Hoh Ah Kay, Esq., F. van der Heyde, Esq., J. Murray, Esq., D. Rodger, Esq., S. J. G. Jellicoe, Esq., C. H. H. Wilsone, Esq., W. B. Smith, Esq.

That this meeting records its hearty thanks to Mr. Leveson for his services as Secretary and Treasurer of the Society, and requests Mr. Wilsone to act in that capacity for the ensuing year.

Proposed by D. Rodger, Esq., seconded by J. S. Atchison, Esq.

That the Vice-President and Treasurer of the Society for the ensuing year and their successors be and they are hereby appointed Trustees of the Society.

Proposed by E. J. Leveson, Esq., seconded by J. Cameron, Esq. and carried with acclamation.

That the best thanks of this meeting be given to His Honour the Governor, for his presence at this meeting and the interest which he has always taken in the welfare of the Society.

Annual Report of the Singapore Agri-Horticultural Society for 1866.

The extensive improvements in the Gardens and the expenditure requisite for completing the lake, having necessitated a considerable outlay, the members will be aware that at the last annual meeting it was decided to hold a second Fête and Fancy Fair, which was accordingly done in the month of May last and the result again proved very satisfactory, the net profit to the Gardens being $1717.21;—and the Committee takes this opportunity of thanking the members and their friends, particularly the ladies, for their kind assistance and support on that occasion.

The Committee have great pleasure in informing the members and subscribers that the Government has been pleased, on application, to grant $50 per mensem towards keeping up the Gardens, which will be of material assistance, seeing that the income of the Society only averages $120 per mensem owing to a falling off in donations and subscriptions.

From a statement which is laid before you this day it will be seen that no less a sum than $17,429.78, has been voluntarily raised in Singapore since the formation of this Society in 1860, of which amount $3749 have been Donations, and, as a great part of that amount has been necessarily devoted to laying out the grounds, which will ere long be completed, the income will in future be available for the actual development of Horticulture and Agriculture.

The Government has kindly allowed the services of 60 prisoners from the House of Correction to carry out the excavation of the lake, but owing to the small number of prisoners in Jail not more than an average of 30 have been available, and of late not more than

10, so that your Committee have been obliged to contract for Chinese coolies to complete the excavation; it is however highly probable that in the course of a week the number may be increased to 25, in which case, as the sluice to let off the water is to be commenced at once, the Committee expect that the lake will be ready to be filled by the end of the year; meanwhile the land on both sides is being tastefully laid out by the able Superintendent, whose exertions have been most meritorious, and Garden Road has been entirely re-metalled, and again opened to the public.

As the lake occupies the only situation where the Coolies employed in the Gardens can live, and as a residence is required for a Superintendent, your Committee have bought the adjacent property, lately belonging to Adam Wilson, Esq., for $1,700 and empowered the Trustees to raise $1,500 on mortgage of the newly acquired land and Superintendent's house to be erected thereon, which has been carried out accordingly.

To construct the Superintendent's house, the Government have kindly consented to allow the Society to be supplied with Bricks from the Government kilns at cost price, and as there will be no immediate necessity for the payment until the Society is in a position to make it, a contract will at once be entered into for the building.

One of the intentions of the Society being to supply members and subscribers with European vegetables, and "to secure improvements in the vegetable products of the island," part of the newly purchased property has been already planted, and as soon as regular fresh supplies of seeds now on the way begin to arrive your Committee expect to be in a position to carry out the object in view.

The plan of the Gardens is now complete, and the titles have been duly received from the Government and are laid before you.

To enable a Government Grant of the land to be made out it was necessary to have two trustees, and consequently your committee have appointed the Vice-President and Treasurer of the Society for the time being, and their successors, in that capacity, which appointment you will be this day asked to confirm.

The Treasurer's accounts are laid before you, showing a balance at credit on the 1st instant of $1,479.44, and the same are submitted to you for confirmation.

It has been brought to the notice of your Committee that some of the residents of Singapore who are not subscribers avail themselves of the Gardens of the Society, although they must be aware that only Members, Subscribers and Strangers have the right of admittance, and the Committee trust, as the funds of the Society depend chiefly upon subscriptions, which just at present are much needed, that all will see the necessity of lending their aid.

The Committee take this opportunity of expressing their thanks to the Government for the ready assistance which has been invariably given whenever asked for.

In conclusion your Committee beg to state that in consequence of the great satisfaction Mr. Niven has given in the discharge of his duties as Superintendent they propose to increase his salary to $80 per mensem from the 1st of January next.

APPENDIX 6.

FROM MANUSCRIPT, BEING THE DRAFT OF A "REPORT TO BE PRESENTED TO THE SOCIETY AT A MEETING OF FEB. 24TH, 1870."

At the last general meeting held on the 2nd June, 1868, the late Hony. Secretary stated that the income of the Society for the ensuing year might be considered fully equal to $200 per month, which would be sufficient for all current expenses; but Mr. Wilsone appears to have forgotten that a large balance was still due to the builder of the Superintendent's house, which with other items of expenditure already sanctioned ultimately amounted to $722.57, and it soon became apparent that the revenue would fall far short of the necessary expenditure.

Under these circumstances your Committee found that the Society was rapidly getting into debt, and that either some means must be devised to increase the revenue or a portion of the Gardens must be allowed to relapse into jungle.

It was considered inadvisable to raise the rates of the annual subscriptions, these being already as high as people are likely to pay, and it was feared that subscriptions would decrease rather than be augmented thereby.

At the same time it was not deemed proper to resort to the means of a Bazaar, as had been done formerly to raise extraordinary sums for special purposes, as the Gardens might now be considered so far complete that a true estimate could be formed of the annual expenditure, and this should be provided for in some way permanently, as no committee could take upon themselves the responsibility of providing funds annually by such precarious means as Bazaars.

It was therefore decided that as the public voluntarily subscribed as much as they could afford, the Government should be requested to increase the then small grant from $50 to $100 per month, and after some correspondence upon the subject the application was favourably considered by the Legislative Council and the extra grant conceded, with the condition that the Government should nominate one official member of the committee, which was readily acceded to and H. F. Plow, Esq., Clerk of Councils, has been duly appointed accordingly.

Your committee in applying for the increased grant expressed their intention of making the Gardens more generally useful; by keeping a nursery of flowers, plants, shrubs, etc., and also raising European vegetables for distribution to members, subscribers and others, and they regret that circumstances have so far prevented them from more than partially carrying out their views, but they expect in the course of the current year to be able to effect all these objects successfully.

By the accounts now laid before you it appears that the gross receipts of the Society during the 18 months between 1st July, 1868, and 31st December 1869, amounted to $4420.86 and the expenditure to $4396.06 showing a balance of $24.80 to the credit of the Society. The income for the next twelve months is estimated as follows, viz:

Subscriptions about	$1600
Government grant	1200
	$2800

and the expenditure for Superintendent's salary, wages, etc., at $2520 leaving a small balance for contingencies and for further improvements in the Gardens.

During the last 18 months the Society has corresponded with and supplied plants to the Gardens at Saigon, Mauritius, South Kensington, etc., and thanks are due to Captain Caldbeck and the P. and O. Company for their kindness in carrying boxes of plants and seeds both ways free of charge, and also to Dr. Scheffer, Director of the Botanic Gardens, Buitenzorg, for the gift of many valuable and interesting plants.

H. E. the Governor having offered to present a certain number of wild animals to the Society in case they should be disposed to form a Zoological collection in the Gardens, your Committee considered the question too important to be settled by them alone and have therefore intimated in the advertisement calling this meeting that they would submit the matter to the whole body of members and subscribers, and you are now invited to decide whether you consider such a course to be practicable and advisable.